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Assessing the Strength Enhancement of Heterogeneous Networks of Miscible Blends of 1,2-Polybutadiene and Polyisoprene[1] CARL GILLER, American Society for Engineering Education, Washington, D.C., MIKE ROLAND, Chemistry Division, Code 6120, Naval Research Laboratory, Washington, D.C. — At typical crosslink densities of elastomers, failure properties vary inversely with mechanical stiffness, so that compounding entails a compromise between stiffness and strength. Our approach to circumvent this conventional limitation is by forming networks of two polymers that: (i) are thermodynamically miscible, so that the chemical composition is uniform on the nm level; and (ii) have markedly different reactivities for network formation. The resulting elastomer consists of one highly crosslinked component and one that is lightly or uncrosslinked. This disparity in crosslinking causes their respective contributions to the network mechanical response to differ diametrically. Earlier results showed some success with this approach for thermally vulcanized blends of 1,2-polybutadiene and polyisoprene, taking advantage of their differing reactivities to sulfur. In this work we explore networks of this miscible blend formed via UV irradiation with a photoinitiator. The vinyl group in 1,2-polybutadiene has a much greater photo-reactivity than the double bond in polyisoprene, resulting in a disparity in respective degrees of crosslinking, while the thermodynamic miscibility is retained. Mechanical properties of the radiation crosslinked blend are compared to conventional networks.

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